

CHAPTER I

Engineers in the New Army

Those who have attempted to describe in a simple phrase the tactics of the most complex war in history refer to World War II as “an air war,” “a mechanized war,” “an amphibious war,” and most inclusively, “a mobile war.” Because its military campaigns accented movement, whether by air, by sea, or by land, and because the primary combat mission of the Corps of Engineers is to aid or impede movement, World War II has also been called “an engineer’s war.”¹ The far-flung deployment of American troops and the global nature of the conflict placed a premium on logistics. As a consequence the engineer mission of building military bases and routes of communication took on added significance. Although arrogating to the engineers an exclusive title to the war would indeed be to lose perspective, merely noting that the claim was made attests to the importance of the engineer role.

During World War II engineer troops built airfields, camps, depots, and hospitals for the invasion build-up in Britain. They overcame German destruction in Italy by clearing the ports and roads of rubble and by throwing bridges across the rivers. They cleared the beaches at the Normandy landings and rolled the supplies across them. Working under heavy fire, they threw ponton bridges across the Rhine, making certain that troops and supplies would continue to push onward after the bridge at Remagen collapsed. Engineer troops opened new

supply routes into China, constructing airfields on either side of the “Hump” and pushing the Ledo Road and the longest pipeline system in the world through the mountainous jungle. In the long fight from Australia to Tokyo, engineers manned landing craft which delivered invading troops on island after island and converted those islands into operating bases. The foundation of this contribution to victory overseas was laid at home in the development of doctrine and equipment, the refinement of troop organization, and the training of citizen soldiers.²

The Engineer Mission

The Corps of Engineers has a long history of service to the nation in war and peace. In 1950 it celebrated its 175th an-

¹ On his return from a tour of the Southwest Pacific theater the Chief of Engineers quoted General Douglas MacArthur: “Reybold, this is an air and amphibious war; because of the nature of air and amphibious operations, it is distinctly an engineer’s war.” Maj. Gen. Eugene Reybold, “Engineers on Our War Fronts,” *Concrete*, III (April, 1944), 33. See also, Lt. Gen. Eugene Reybold, *Engineers in World War II, A Tribute*, pamphlet [1 Nov 45], p. 1. EHD files.

² For the history of the Corps of Engineers overseas, see Ralph F. Weld, Abe Bortz, and Charles W. Lynch, *The Corps of Engineers: The War Against Germany*, and Karl C. Dod, *The Corps of Engineers: The War Against Japan*, volumes in preparation for the series UNITED STATES ARMY IN WORLD WAR II.

niversary, thus honoring the date when Richard Gridley was appointed Chief Engineer of the Revolutionary forces. Congress established a Corps of Engineers in 1779, only to disband it in 1783. An act passed 16 March 1802 established the present Corps and provided that it should be "stationed at West Point . . . and shall constitute a Military Academy" Although the faculty at West Point was but for a short time predominantly "Engineer," the Corps remained in charge of the school until 1866. The Corps of Engineers had meanwhile been singled out to perform tasks which have been variously known as "non-military," "civil works," or "rivers and harbors." In 1824, Congress authorized the President "to cause the necessary surveys, plans, and estimates, to be made of the routes of such roads and canals as he may deem of national importance, in a commercial or military point of view, or necessary for the transportation of the public mail" and "to employ two or more skillful engineers, and such officers of the corps of engineers, or who may be detailed to do duty with that corps, as he may think proper" Thereafter Army engineers were in the vanguard of westward expansion. They improved the navigation of the Mississippi and Ohio Rivers, selected the route of the Chesapeake and Ohio Canal, superintended the construction of the National Road, and surveyed the routes of many railroads.³

The Army engineer is no less proud of the military history of his Corps than of its peacetime accomplishments. Although his unique contribution is as a technician, the engineer soldier is a fighter as well. The exploits of the Union Army's Engineer Battalion at Antietam illustrate his versatility:

The night before the battle of Antietam the Battalion rendered three of the fords of Antietam Creek passable for artillery, by cutting down the banks and paving the bottom with large stones where it was too soft. During the battle the Battalion guarded and kept open these fords. The night after the battle, the Battalion, at the request of its commander, was ordered to report to Gen. Porter to act as infantry and in that capacity supported Randall's battery of the First Artillery in the advance to Shepherdstown. After the arrival of the army at Harper's Ferry it built one bridge over the Potomac and another over the Shenandoah and was busily engaged on the fortifications during the month it remained there.⁴

During World War I, the Corps of Engineers grew from 256 officers and about 2,220 enlisted men to 11,175 officers and about 285,000 men. In France its most important job was keeping open the routes of communication but, as in the Civil War, engineer soldiers were prepared to act as infantry in combat, and their service at Belleau Wood and during the German offensive of March 1918 contributed much toward the Allied victory.

During the period between World War I and II, the military duties of the Corps of Engineers remained the same. If war came, its troops were to clear the way and build;

³ Historical sketches of the Corps of Engineers are found in (1) Lt. Col. Paul W. Thompson, *What You Should Know About the Army Engineers* (New York: W. W. Norton & Company, Inc., 1942); (2) W. Stull Holt, *The Office of the Chief of Engineers of the Army, Its Non-Military History, Activities, and Organization* (Baltimore: The Johns Hopkins Press, 1923); (3) Engr Sch, *History and Traditions of the Corps of Engineers* (Fort Belvoir, Va.: Engineer Center, 1949); (4) Engr Sch, *The News Letter*, II (May, 1950); (5) EHD, *The Corps of Engineers Historical Index* (1943).

⁴ Quoted in 1st Lt. C. A. Youngsberg, *History of Engineer Troops in the United States Army, 1775-1901* (Washington Barracks: Press of the Engineer School, 1910), Engr Sch Occasional Papers 37, 1910, p. 11.

to survey and map; to supply water and electricity; to develop materials and techniques for camouflage; to operate railroads. With the exception of railroad operation, transferred to the newly created Transportation Corps in November 1942, these were the jobs for which the engineers prepared and which they carried out during World War II.

Probably because of the broad scope of engineer responsibilities both in peace and war, the Corps had become accustomed to expecting the cream of the West Point graduating class to elect service with it. When the top man in the class of 1941 failed to select the Corps of Engineers, the head of the Engineering Department at the Military Academy undertook to cushion the Chief of Engineers for the shock:

You will probably have to take a bit of joshing over the fact that the No. 1 man chose the cavalry. . . . This man, who is a very fine one, was 'crazy' about horses when he entered. . . . This love . . . has stayed with him and, since the cavalry is the only branch that has many horses left, he was consistent in choosing the cavalry.⁵

Actually, this particular Chief of Engineers remained sanguine when top men failed to choose the Corps. He thought that a different choice tended to silence protests from other branches that they also needed men who showed outstanding promise and tended to have a sobering effect upon those Engineer officers who regarded the Corps as an exclusive branch, different from, and perhaps superior to, the other branches. Insofar as exclusiveness aided *esprit*, he welcomed the sentiment; insofar as it posed a threat to teamwork, he deplored it. But whether this loss by the Corps of some of the top men of West Point was a cause for embarrassment or for silent congratulation,

such occasions were rare. In 1940, the Engineer quota of 40 was filled from the first 67 men in a class of 445; in 1941, its quota of 50 was filled from the first 69 in a class of 427. The Engineers were indeed fortunate. Such men were accustomed to working hard and to succeeding. They were proficient in book learning—an indispensable tool in the mastery of a technical profession.⁶

Accustomed to outstanding qualities in its West Point graduates, the Engineers sought to set a similar high standard among appointments made from civil life. As one Engineer officer expressed it, the Corps "should not be satisfied with anything less than 'A' No. 1 cracker jack ring-tail elephants to whom you can give a job, forget about it, and know that you will get one hundred per cent results."⁷ The Engineers looked to the construction industry, whose ranks were filled with graduates of technical colleges, to furnish many such officers in an emergency. Contacts with this "reserve" were assured through the civil works activities of the Corps and through mutual membership in the Society of American Military Engineers and other national engineering societies.

The *esprit de corps* created by the belief among Engineer officers that they constituted a select group and that they were the heirs of many years' service to the nation led Lt. Gen. Brehon B. Somervell, commanding

⁵ Ltr, [Lt Col Thomas D.] Stamps, Dept of Civil and Mil Engr, USMA, to CofEngrs, 23 May 41. 210.3, Engrs Corps of, Pt. 17.

⁶ (1) *Ibid.* (2) Memo, TAG for CofEngrs, 23 Apr 41. 210.3, Engrs Corps of, Pt. 16. (3) Incl, n.d., with Ltr, Maj Gen Julian L. Schley to C of EHD, 4 Jun 52. EHD files. (All letters to the chief of the Engineer Historical Division are in Engineer Historical Division files.)

⁷ Ltr, Brig Gen Dan I. Sultan, CO Ft. Logan, to C of Opns and Tng Sec, 28 Feb 39. 210.1, Engrs Corps of, Pt. 6.

the Army Service Forces—himself an Engineer officer—to declare that “the sentimental angle . . . was probably stronger in my own Corps than in any other in the Army. . . .”⁸ Sentimentality was exemplified by the cherished Engineer button, different in design from the standard Army button and to be seen only on the uniforms of members of the Corps of Engineers. Confidence marked the Engineers’ tendency to translate its motto, *Essayons*, as “Let us succeed” rather than “Let us try.”⁹

Except at the very top, the Corps of Engineers always maintained a clear-cut administrative division between its civil and military functions. The Chief of Engineers was the only person charged with both activities. In carrying out his civil works duties, he reported directly to the Secretary of War. On the military side, he was responsible to the War Department’s Chief of Staff for the development of doctrine, the selection of equipment, and the training of troops. Once trained, the majority of Engineer officers and enlisted men were removed from his control except in technical matters. The Chief of Engineers was in direct command only of such troops as were not assigned to a territorial commander or were not part of a tactical unit containing other branches. In the fall of 1940 most engineer troops were assigned either to overseas departments, to one of the nine corps areas into which the United States was divided, to one of the four armies which took over tactical command of ground troops under Army General Headquarters in October of that year, or to the GHQ Air Force. Despite the limited nature of his command functions, the Chief of Engineers exercised a continuing influence on engineer troops. Although he could not order them to throw

a bridge across a particular river, they built it with the equipment and according to the methods he had approved. Thus, in both a civil and a military way the Chief of Engineers was the arbiter of all Engineer policy and was in the final analysis answerable for the technical performance of engineer troops in the field and of officers and civilians employed on civil works.¹⁰

When World War II broke out in Europe in September 1939, the Chief of Engineers was Maj. Gen. Julian L. Schley. Fifty-nine years old at this time, he was midway in his four-year term, having been appointed on 18 October 1937. General Schley thus began his service as Chief during the period when the Army was beginning to expand in size and to modernize its tactics and equipment. His retirement came just prior to Pearl Harbor. Before becoming Chief of Engineers General Schley had had the usual distribution of assignments, about evenly divided between military duties and civil works. The two main administrative divisions of the Office of the Chief of Engineers (OCE)—Civil Works and Military—formed a staff of advisers to prepare tentative plans and policy recommendations, to set approved policies in operation, and to supervise their execution. Each was headed by an assistant to the Chief of Engineers who passed recommendations up to the Chief but also approved without reference to him many

⁸ Quoted in John D. Millett, *The Organization and Role of the Army Service Forces*, UNITED STATES ARMY IN WORLD WAR II (Washington, 1954), p. 406.

⁹ (1) Thompson, *op. cit.*, pp. 18–19. (2) *The News Letter*, *op. cit.*, pp. 3–4. (3) Samuel T. Williamson, “Fighting Handymen on Every Battlefield,” *New York Times Magazine*, April 11, 1943.

¹⁰ AR 100–5, 28 Nov 33, 26 Jun 42.

matters within established policy which were not routine. (*Chart 1*)

In addition to the Civil Works Division in Washington, the Corps of Engineers maintained an extensive field organization, the Engineer Department, for on-the-spot supervision of its rivers and harbors projects. For this purpose the United States was divided geographically into eleven divisions, each made up of several districts. For example, the North Atlantic Division included eight district offices, seven in the United States and one in Puerto Rico; the Lower Mississippi Valley Division, three district offices.¹¹

The relative importance of civil works and military activities varied according to whether the nation was at peace or at war. When, in the years following World War I, the military activities of the Corps of Engineers were, in common with those of other branches of the Army, afflicted by paucity of funds and other frustrations, the spirit of the Corps' officers was kept high through assignments to rivers and harbors duty and to various public works sponsored by the federal government. While Army officers in general struggled with outmoded equipment and small-scale training exercises, many Engineer officers found themselves in the center of New Deal pump-priming. Some in this group were loaned to various New Deal agencies; others were assigned to work within the Corps itself. No matter where they went they found challenging jobs, supervising the building of vast networks of roads and the construction of such huge installations as the Bonneville and Fort Peck dams. The Engineers maintained that such experience did more than build morale. Typical of their attitude was the enthusiastic agreement of an Engineer officer with a congressman's summation



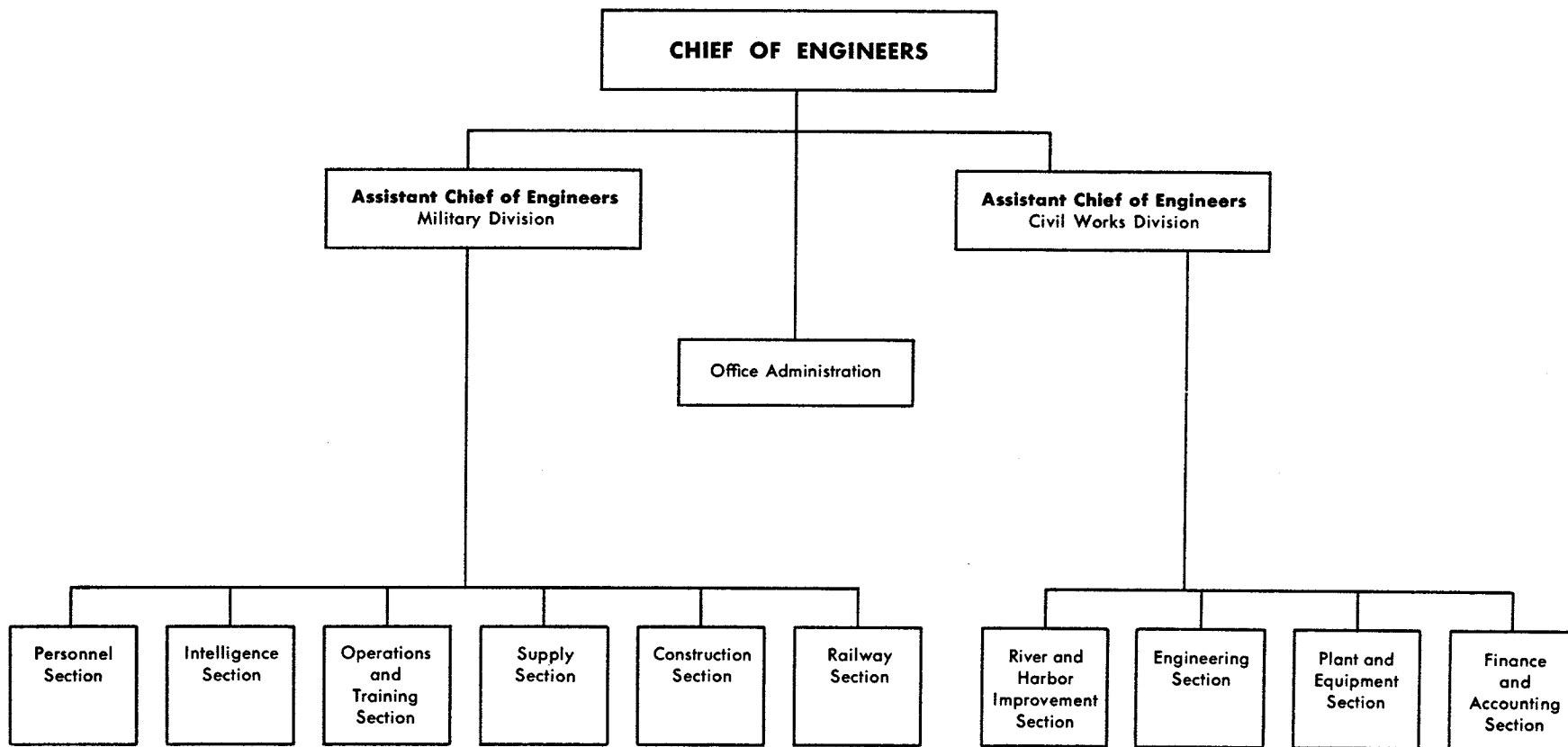
MAJ. GEN. JULIAN L. SCHLEY,
*Chief of Engineers from October 1937 until
October 1941.*

that "while their jobs may have to do with engineering projects which have no immediate military connection, such assignments do equip them in the best possible way to tackle the problems which would confront them in time of war."¹² The unique combination of civil works and troop duty, the Corps was convinced, produced something more than the pioneer infantryman who served as the engineer of other armies. The Engineer officer was a soldier with a knowledge of civil engineering. Tours of duty with civil works afforded him an opportunity to learn about the latest construc-

¹¹ Orgn Charts OCE, 1 Sep 39, 1 Aug 40, 27 Feb 41. EHD files.

¹² *Military Establishment Appropriation Bill for 1941, Hearings before the Subcommittee of the Committee on Appropriations, HR, 76th Cong, 3d Sess, p. 657.*

CHART 1—ORGANIZATION OF THE OFFICE OF THE CHIEF OF ENGINEERS: SEPTEMBER 1939



tion techniques and equipment and to gain experience in organizing the work of large groups of men. Yet on the whole, the relationship of the Civil Works Division and its field offices to the wartime mission of the Engineers was an indirect one.

Developing fighting engineers was the job of the Military Division. During the period when Schley was Chief of Engineers, Brig. Gen. John J. Kingman was his assistant in charge of the Military Division. Kingman's division was composed of six sections: Operations and Training; Personnel; Supply; Intelligence; Construction; and Railway; and of two field agencies—the Engineer School and the Engineer Board—located nearby at Fort Belvoir, Virginia. Central to them all was the Operations and Training Section (O&T) which had the task of over-all planning both for the proficiency of personnel and the efficiency of equipment. O&T prepared tables of organization (T/O's) which outlined the structure of each troop unit and tables of basic allowances (T/BA's) which listed the types and amounts of equipment to be issued. O&T also supervised the training of all officers and enlisted men, drawing up general educational programs, determining specific curricula, and preparing training literature. The Personnel Section decided whether officers would be assigned to troop units, to schools, to civil works, or to other duties. The Supply Section computed the quantities of equipment needed, bought it, saw that it was delivered when and where needed, and supervised the development of new types. The other two sections of the Military Division in Washington had more specialized duties. The Intelligence Section had charge of all military mapping, including supervision of the Engineer Reproduction Plant, and was consulted on the



BRIG. GEN. JOHN J. KINGMAN,
*Assistant Chief of Engineers, Military
Division.*

development of new techniques and equipment for map making. This section also investigated new applications of engineering skills in the light of changing military tactics. During peacetime years the principal job of the Construction Section was the provision and maintenance of seacoast defenses. While this work continued and even increased for a time, the section's other responsibilities—the preparation of designs for structures and installations in theaters of operations and the preparation of plans for the management of public utilities there—eventually overshadowed it.¹³

For advice in theoretical and technical matters all sections of the Military Division looked to Fort Belvoir, the Engineer center for the training of men and the development

¹³ OCE Mil Div Manual, Duties and Procedure, 1937 (Rev).



MAJ. GEN. THOMAS M. ROBINS,
*Assistant Chief of Engineers, Civil Works
Division. (Photograph taken 1943.)*

of new equipment. Here the Engineer School conducted advanced courses for officers and for enlisted men, prepared extension and conference courses for National Guard and Reserve officers, and wrote training literature. In this quasi-academic atmosphere, Engineer doctrine and methods of training were critically examined and recommendations for revision forwarded to the Chief's office. The Engineer Board carried on a similar function in regard to equipment. In the course of its investigations the board engaged in theoretical studies and performed experiments and tests in order to place more efficient tools and equipment in the hands of engineer troops.¹⁴

Until mid-1941 the Chief's office and its agencies at Fort Belvoir constituted a small organization. Everyone knew everyone else and business was carried out in an informal,

personal atmosphere. Co-ordination, recalled one Engineer officer, "was a matter of going next door, or walking down the hall" to ask the advice of friends.¹⁵ For his part, Schley met regularly and often daily with Kingman and Brig. Gen. Thomas M. Robins who was his assistant in charge of the Civil Works Division. General Kingman visited Fort Belvoir frequently and encouraged his subordinates to follow his example. He and Schley also made many trips to engineer units stationed in the field. These visits, with the opportunities they afforded to exchange ideas with those closest to engineer troops, were supplemented by a series of Information Bulletins through which OCE sought to keep the field abreast of developments in military engineering at home and abroad.¹⁶

The administrative organization of the Military Division provided a comprehensive framework readily adapted to meet an emergency situation. It was not until mid-1941 that the military activities of the Corps began to compel the attention accorded to civil works activities in peacetime. The importance of civil works was well defined by the chairman of a Congressional committee when he remarked to General Schley: "We do not have much opportunity to discuss with you the military side of your responsibility, because, nor-

¹⁴ ARs 350-300, 19 Oct 38, 15 Jun 42; 100-30, 26 Jan 32, 14 Aug 42.

¹⁵ Interv, Col Gerald Galloway, 12 Sep 50. See also similar remarks by Col. Miles M. Dawson in Interv, 20 Sep 50, and Ltr, Col William M. Bessell, Jr., to C of Mil Hist, 16 Jan 54. (All interviews and all letters to the Chief of Military History are in Engineer Historical Division files.)

¹⁶ (1) Incls, n. d., with Ltrs, Schley to C of EHD, 4 Jun 52, and 26 Jun 52. (2) Interv, Brig Gen Claude H. Chorpeneing, 10 Jul 50.

The series of Information Bulletins began in 1933 and extended through 1943. A set is on file in the OCE Library.

mally, by far the larger part of the funds we appropriate to your branch are for nonmilitary functions.”¹⁷ Most congressmen thought of the Corps of Engineers in relation to improvements that would be made to the rivers and harbors adjacent to their home communities. Conscious of this personal interest, Schley felt “it was the part of wisdom to be present” at the hearings on the appropriation bill for civil works, even though he had perfect confidence in the ability of Assistant Chief of Engineers Robins to make the presentation. The Chief of Engineers felt no such compulsion to appear in defense of the military budget and, unlike the chiefs of other arms and services, did not do so. General Kingman usually represented the Corps at such hearings.¹⁸

For the fiscal year 1938, Congress appropriated but \$599,400 in military funds, \$234,465,300 in civil funds to the Corps of Engineers; in 1939, \$4,358,380 in military funds, \$201,885,800 in civil; in 1940, \$3,044,340 for military activities, \$279,364,000 for civil works. By 1941, however, military funds began to comprise a significant portion of the budget. For that year the Engineers received a military appropriation of \$66,405,955 as against a civil works appropriation of \$214,878,310. Another \$200,000,000 came to the Corps early in fiscal year 1941 for the construction of military airfields, a program hitherto under the jurisdiction of the Quartermaster Corps.¹⁹

The transfer of the supervision of Air Corps construction from the Quartermaster Corps was the first of two steps in the consolidation of all military construction in the Corps of Engineers. Vital as was the construction program to military preparedness, responsibility for its execution perpetuated the split personality of the Corps, for the

military construction program, like the civil works program, had little direct bearing on the creation of engineer soldiers. Schley was confident of the Corps’ ability to carry out civil and military construction as well as prepare its troops for war. Normally, he explained, between one third and one quarter of the Regular Army officers were assigned to civil works. Most of the personnel engaged in civil works were civilians. It was possible therefore to transfer officers from civil to military duty without danger to the functioning of the organization, and this was done beginning in the fall of 1939. A similar policy, he promised, would govern the supervision of military construction.²⁰

This transfer of officers was but one aspect of the shift from a peace to a war footing. During the period 1939–41 the number of engineer enlisted men increased from somewhat under 6,000 to almost 70,000.

¹⁷ Statement of Congressman J. Buell Snyder, 20 March 1941, in *War Department Civil Functions Appropriation Bill for 1942, Hearings before the Subcommittee of the Committee on Appropriations*, HR, 77th Cong, 1st Sess, p. 23.

¹⁸ (1) *Hearings on Military Establishment Appropriation Bill and Hearings on War Department Civil Functions Appropriation Bill*, 1940, HR, 76th Cong, 1st Sess; 1941, HR, 76th Cong, 3d Sess; 1942, HR, 77th Cong, 1st Sess. (2) Incl, with Ltr, Schley to C of EHD, 4 Jun 52.

¹⁹ Incl, Appropriations for Mil and Civil Functions CE, with Memo, C of Budget and Programs Div OCE for C of EHD, 6 Jun 55. During the fiscal years 1938–41 the Corps of Engineers also received approximately \$14,886,600 for construction of sea-coast defenses.

For the military construction program, see Lenore Fine and Jesse A. Remington, *The Corps of Engineers: Military Construction in the United States*, a volume in preparation for the series UNITED STATES ARMY IN WORLD WAR II.

²⁰ (1) *Hearings on War Department Civil Functions Appropriation Bill*, 1942, HR, 77th Cong, 1st Sess, 20 Mar 41, pp. 23–24. (2) Testimony of Col Stuart C. Godfrey, 11 Mar 40, in *Hearings on Military Establishment Appropriation Bill*, 1941, HR, 76th Cong, 3d Sess, p. 657.



1ST DIVISION ENGINEERS WORKING ON A MUDDY ROAD, *Ardennes, France, November 1918.*

Concurrently with the reception and training of these citizen soldiers the Corps of Engineers adjusted to the radical changes in weapons, structure, and tactics that distinguished the new from the old Army.

Engineers in the Old Army

The United States Army of the twenties and thirties was largely a product of World War I. Trench warfare characteristic of that conflict had left a deep impress on military organization and tactics. The basic unit of the old Army was the square infantry division which took its name from the four infantry regiments it contained. Tied to a clumsy combination of foot soldiers, horses, and motor vehicles, the square division lacked mobility, and its planned wartime strength of 22,000 men would have made it

difficult to maneuver. The Army of the thirties was too small to permit the organization of echelons higher than a division, but in case of emergency, the War Department planned to group divisions and supporting units into corps, armies, and a general headquarters.²¹

Engineer functions in these echelons of command conformed to experiences winnowed from World War I. The major task in that war had been repair and maintenance of the muddy roads of France, and the Engineers expected that road and other work to keep the routes of communication open would account for seventy-five percent

²¹ For a detailed discussion of the reorganization of the Army, see Kent Roberts Greenfield, Robert R. Palmer, and Bell I. Wiley, *The Organization of Ground Combat Troops*, UNITED STATES ARMY IN WORLD WAR II (Washington, 1947).

of their efforts in a future conflict. Next in the order of engineer jobs during World War I had been the preparation of defensive works, the erection of obstacles, and the construction of shelters and other buildings. The Engineer Field Manual of 1932 reflected that experience. Most of its space on field fortifications was devoted to trench construction. There were few pages on anti-tank obstacles, and there was little appreciation of the value of antitank mines. Construction of airfields was given but limited coverage.²²

The engineer units which evolved as a result of World War I were classified either as general or as special units. General units included the engineer combat regiment of the infantry division, the engineer squadron of the cavalry division, and the general service regiments and separate battalions which were distributed among corps, army, and communications zone. The combat regiment did any temporary engineering work required for the accomplishment of the division's mission—repairing and building roads and bridges, creating obstacles, assisting in the organization of defensive positions, constructing advance landing fields for the Air Corps, maintaining the division's water supply, providing maps, and building troop shelters. While the combat regiment was supposed to fulfill only immediate front-line needs, its work was conditioned by the slow-moving character of the division. The engineer squadron, being part of the more mobile cavalry, emphasized hasty road repair and reconnaissance but performed the same general tasks within the limits of its personnel and equipment.

According to Engineer doctrine in the nineteen-thirties one sixth of an Engineer force in a theater of operations would have been composed of these divisional units.

The bulk of engineer troops, nearly two thirds, would have been located in general service regiments and separate battalions for duties behind the front. For the more extensive and permanent work required in the rear areas the general service regiment was equipped with a variety of tools and specially trained soldiers. With its large pool of unskilled labor, the separate battalion was designed to support other units as well as to undertake missions of its own.

Special units, intended to comprise one fifth of an Engineer force, were organized to perform particular tasks. They included light ponton companies and heavy ponton battalions for the care and transportation of bridging equipage, topographic units to make and supply maps for army and general headquarters, water supply battalions to deliver water in areas where the local supply was inadequate, dump truck companies to transport construction materials, depot companies to handle engineer supplies, shop companies for the general maintenance of engineer equipment, and camouflage battalions to supervise camouflage and supply special materials.²³

Although mobilization plans called for all these organizations, they constituted merely a paper classification. In September 1939 the Regular Army had only twelve active engineer units. Eight were combat regiments or parts of regiments down to a company; one, a squadron minus a troop; another, one troop of a squadron. The other two were topographic battalions. The small size of the peacetime Army coupled with the necessity for a core around which to form an

²² (1) Info Bull 34, 27 Oct 39, Hist of CE. (2) Military Handbook for National Guard and Reserve Engineers (Engr Sch, 1937), p. 153. (3) Engineer Field Manual (2 vols., Washington, 1932), *passim*. (Cited hereafter as EFM.)

²³ EFM, I, Engineer Troops.

initial protective force had dictated this concentration of enlisted men within combat units.²⁴

Reorganization of Division and Corps Units

Shortly after General Malin Craig became Chief of Staff in 1935 he ordered a re-examination of the organization and tactics of the Army. The aim was an increase in mobility; the means, the use of mechanical power to the utmost and a reduction in the size of troop units. The period between the two wars had been marked by great improvements in motor vehicles, tanks, and airplanes, which made the adoption of new tactics imperative, while advances in the design of weapons made cuts in personnel feasible without a loss of fire power. In the case of the infantry division, still further reductions could be made by relegating personnel and equipment needed only under certain contingencies to corps.

With these guiding principles the Army embarked in 1936 on a reorganization of the infantry division. The new triangular division that resulted contained three instead of four infantry regiments. Reductions in other elements reduced the planned wartime strength of the division from 22,068 to 13,552 men. The engineers shared in the general cut. The combat regiment of 868 officers and men was changed to a battalion of 518. But in relative numbers the engineer component remained about the same—3.8 percent of the division's strength. By way of indicating what could be done to reduce auxiliary units, Craig had mentioned the possibility of eliminating the engineers from the division entirely. The committee which specified the organization of the triangular division rejected that idea, possibly because of the expectation that increased depend-

ence on motor vehicles would mean increased dependence on roads and bridges, but more likely because of the desire to avoid so drastic a change prior to testing. At any rate the new engineer battalion retained substantially the same functions as the old regiment.²⁵

After the triangular division was tested in 1937, its officers recommended further cuts. For the engineers this meant a drastic reduction to a single company of 175 officers and men, only 1.7 percent of the division's strength. Proper reconnaissance, the argument ran, would enable the division to detour around blown bridges and other obstacles in the movement that preceded actual combat. Once the battle was joined, the division would require only emergency repair of roads, while other engineer tasks such as demolitions and roadblocks could be executed quickly. There seemed therefore to be little organic need for divisional engineers in open warfare. In the following months this viewpoint was to meet strong opposition from the Corps of Engineers.²⁶

Responsibility for expounding the opinions of the Corps of Engineers on organizational matters rested with the Chief of Engineers, and more specifically with the

²⁴ (1) Annual Report Covering Military Activities of the Corps of Engineers for the Fiscal Year Ending June 30, 1939. (Cited hereafter as Ann Rpt OCE. These reports are in EHD files.) (2) The Engineer Protective Mobilization Plan, 1939 (Tentative), 15 May 39. EHD files. (3) Mark Skinner Watson, *Chief of Staff: Prewar Plans and Preparations*, UNITED STATES ARMY IN WORLD WAR II (Washington, 1950), pp. 26–30.

²⁵ (1) O&T Office Study 131. EHD files. (2) Lecture, Col S. C. Godfrey, *The Streamlined Division and Its Engineer Component*, 9 May 38. 350.001, Pt. 10. (3) *Military Handbook for National Guard and Reserve Engineers*, pp. 24–25.

²⁶ Rpt of Fld Sec Test of Proposed Inf Div, App. A, 21 Mar 38. McNair Papers.

Operations and Training Section. From 1937 to 1941 O&T was headed by Col. Stuart C. Godfrey, who had served overseas during World War I. Thereafter, he had had tours of duty as an instructor at the Command and General Staff School, as a troop unit commander, and as a District Engineer. Among his assistants, Maj. Louis J. Claterbos, who became his executive officer, Capt. Gerald E. Galloway who headed the organization and equipment subsection, and Maj. Kenner F. Hertford, who succeeded Galloway, were particularly concerned with the organization of engineer units. These men did the spade work in preparing the arguments with which Schley and Kingman forcefully promoted the Engineers' point of view.²⁷

The O&T Section obtained some of its arguments in turn from the Engineer School and the Engineer Board, and from units in the field, but the Chief's office was often guided by different considerations from those of these subordinate organizations. O&T had to face the practical problem of not making impossible demands on the General Staff. The proposals that went forward, therefore, were usually limited to requests which would not be considered unreasonable. At the same time the Engineers tried to assure themselves a sympathetic hearing by making a concerted effort to place able officers from the Corps in positions of responsibility on the General Staff itself.²⁸ "I believe," Godfrey advised General Schley in February 1939, "that the most effective way to ensure full consideration of our needs, for men and equipment, is to secure a larger representation on the General Staff. Major Wood's detail to G-4 has already been very helpful in this connection. The present opportunity to recommend an Engineer for detail in the im-



COL. STUART C. GODFREY, *Chief of Operations and Training Section from 1937 to 1941.*

portant Mobilization Section of G-3 should, in my opinion, be taken advantage of, even at the expense of some other activity."²⁹ In mid-1939 there were five Engineer officers assigned to the General Staff, which at this time numbered about one hundred. In the fall of 1940 there were six, one of whom, Maj. Gen. Richard C. Moore, was deputy chief of staff for supply and transportation, and another, Brig. Gen. Eugene Reybold, the G-4. Many of the letters and memoranda addressed to the General Staff were delivered personally by Schley or by Kingman, who, on these occasions and others, sought to keep themselves posted on

²⁷ Orgn Charts OCE, 1937-41. EHD files.

²⁸ (1) Incl, n. d., with Ltr, Schley to C of EHD, 4 Jun 52. (2) Interv, Maj Gen Clarence L. Adcock, 27 Dec 51.

²⁹ Memo, ExO Mil Div for CofEngrs, 21 Feb 39. 475, Engr Equip, Pt. 1.

the staff's point of view as well as to present that of the Engineers.³⁰

The Engineers' views were naturally motivated in part by branch loyalty. Thus, one unit commander wrote in 1938: "If we are not careful, such organizations as Reconnaissance Squadrons will beat us to the punch in providing their own means for what should be our work."³¹ But the basis of their arguments was usually a carefully reasoned estimate of what a given situation would require of military engineers. In the reorganization of the infantry division the Engineers were faced with a current of opinion which would have diminished their position and they fought to maintain it, convinced that the military situation had been inadequately evaluated.

While the Engineers were acutely conscious of the new mobility, it was the vulnerability of vehicles to obstacles which they emphasized and on which they based their criticisms of the proposed cuts. They insisted that the growing use of motor transport demanded more, not less, road work—a fact that had not been apparent in the 1937 tests where there had been no mud and no shelling. Predicting that the enemy would attempt to blow every bridge along a line of retreat, the Engineers foresaw a need for more bridge building, which would be complicated by the necessity of supporting heavier trucks and tanks. To impede the movement of the enemy, on the other hand, roadblocks, antitank mines, and demolitions along possible avenues of attack had become increasingly important.³² In support of their position the Engineers pointed to the proportion of engineers found in British and German divisions and to the remarks of a non-Engineer military attaché in Germany who wrote:

I have become very much struck in recent months here by the enormously increased importance which the German Engineers are receiving. . . . The reason for this increased importance is the motorization and mechanization now taking place in all armies in the world. I do not take issue with such mechanization and motorization, but desire to point out that there are disadvantages as well as advantages thereto, and that no unit of the army is better designed to take advantage of the weaknesses of motorization than an engineer unit.

. . . By all means motorize a part of our army, but by all means also, along with this motorization, give to the engineer corps that increased importance which is rightfully theirs through the sensitiveness of motor transport to the demolition and obstruction of routes of communication.³³

The General Staff did not accept the 1937 tests as conclusive and scheduled more extended ones in 1939. For these the engineer component in the division consisted of a battalion of 11 officers and 269 enlisted men. This was the peace strength of the unit; its war strength was 15 officers and 393 men, about 3.7 percent of the whole division. As set up the battalion was responsible for reconnaissance, hindering

³⁰ (1) Ray S. Cline, *Washington Command Post: The Operations Division, UNITED STATES ARMY IN WORLD WAR II* (Washington, 1951), pp. 23–24. (2) Ann Rpts OCE, 1939, 1940. (3) Longhand notations on memos for CofS. 320.2, Pt. 22.

³¹ Ltr, Maj Henry Hutchings, Jr., CO 8th Engrs, to Godfrey, 13 May 38. O&T Office Study 114, EHD files.

³² (1) Memo, CofEngrs for CofS, 2 May 38, sub: Engr Component of the Inf Div. Loose Papers O&T Sec, EHD files, Orgn of Inf Div. (2) Lecture, Godfrey, *The Streamlined Division and Its Military Component*, 9 May 38. 350.001, Pt. 10.

³³ Extract from a letter from an authoritative military observer in Germany, November 1937, Incl, with Ltr, ACofEngrs to CofCav, 16 May 38, sub: Div Units for Cav Div (Mecz). O&T Office Study 114, EHD files.

enemy movements, improving road and stream crossings, taking measures for defense against mechanized attack, and helping to organize defensive positions. Road building, map reproduction beyond simple sketching, and emergency bridging were cut out so far as divisional engineers were concerned. When the Office of the Chief of Engineers objected to the elimination of floating bridge construction from the battalion's functions, the War Department pointed out that absence of streams in the testing area would prevent experimentation! While the Engineers had succeeded in securing almost as much relative strength in this division as in the one tested in 1937 they still felt there was a strong sentiment in favor of reducing their strength to a company.³⁴

In September 1939, before the War Department announced new tables, Schley presented his views to the General Staff once again. He proposed that the engineer battalion be organized with a peace strength of 350 men and a war strength of 520. Although these numbers were considerably less than the 800-man battalion recommended by the Engineer Board and the Engineer School around the same time, or the 642-man battalion recommended by Schley himself in 1937 when he was commandant of the Engineer School, their acceptance would have raised the wartime strength of the engineer component to 4.3 percent of the division. In support of this recommendation, Schley stressed again the unrealistic nature of the 1937 and 1939 tests, where favorable weather and lack of destruction had minimized the need for engineer troops, and called attention to the reserve of fire power which the engineers could supply. He also noted a new factor—the experience of the German Army in Po-

land—and observed that its rapid advance against obstacles “must have demanded a great amount of engineer work.”³⁵ The General Staff was not persuaded. In September 1939 the War Department authorized a peace strength battalion of 300 enlisted men. Shortly thereafter the battalion's war strength was set at 420 enlisted men, or 3.5 percent of the division. The relative strength of engineers in the triangular division was thus to be .3 percent less than in the square division, but this was a far cry from reduction to a company.

The outbreak of war in Europe had meanwhile led the President to increase the Regular Army by 17,000 men. However inadequate the expansion of the Army, it made possible the formation of four more triangular divisions and of a few corps and army units. In its search for mobility the War Department had considered the composition of army corps along with the infantry division but no firm conclusions had been reached. The authorization of more manpower and a definite decision on the infantry division brought the question up again. Under the old Army organization, engineer units had been allotted on the basis of one general service regiment, three separate battalions, one depot company, and one light ponton company to a corps. Since under the reorganization many functions formerly performed by divisions had been relegated to corps, Schley proposed to change the character and strength of the corps' engineer component. The new organization which he recommended in Sep-

³⁴ The preceding paragraph and the discussion following are based upon: (1) Corresp in 320.2, Pts. 22, 23; (2) Loose Papers O&T Sec, EHD files, Orgn of Inf Div; (3) O&T Office Study 131, EHD files.

³⁵ Memo, CofEngrs for CofS, 12 Sep 39, sub: Engr Component of Inf Div. 320.2, Pt. 22.

tember 1939 consisted of a corps combat regiment with 700 men in peace and 1,120 in war, a general service regiment of the same strength, and a light ponton company. The combat regiment was to reinforce the divisional engineer battalion in such operations as river crossings. The general service regiment, with its heavier equipment, was to be responsible for combat-support bridging, maintenance of roads and railroads, and general construction. The ponton company was to maintain a pool of bridging equipment and boats for assault crossings.

Although it accepted the strength of the general service regiment, the War Department eliminated the light ponton company and reduced the war strength of the combat regiment to 782 men. In explanation, the War Department laid down the principle that, as in the case of the division, corps troops were to maintain the same ratio to over-all strength in war that they had in peace, 6.3 percent. This seemed reasonable to the General Staff in light of the fact that less than half of the 11 percent of engineer troops in the American Expeditionary Force had been assigned to corps.

In the weeks that followed the engineers continued to contend for more troops in division and corps—centering their attention on proposed war strengths which would not have required any immediate increase. While acceding to the elimination of the ponton company from the corps, OCE suggested that it be replaced by a topographic company to compensate for the reduced mapping potential of division engineers. Schley and Kingman wrote repeatedly of the need for more Engineers. They questioned the use of percentages in settling the matter and, particularly, the percentages used by the War Department. Engineer work could not be measured solely by the

decrease in numbers of divisional troops. The area to be covered must be taken into consideration, and, with greater mobility, the area would probably be larger than before. When it suited their purposes, the generals used World War I experience, but more and more they stressed the current European war and the fact that the engineers were fighters as well as technicians. On 3 October 1939, Schley wrote caustically: "The Germans believe that the modern trend toward motorization and mechanization demands a *much larger* proportion of Engineer and other technical troops with the combat troops than formerly. We seem to be moving in exactly the opposite direction."³⁶

The General Staff capitulated under the weight and persistence of these arguments. By December the War Department had approved the topographic company, and a war strength of 520 for the engineer battalion and 1,100 for the combat regiment. Engineers now composed 4.3 percent of divisional and 8.0 percent of corps strength. Thus a relative gain had been made—a gain the Engineers had insisted was essential to meet the demands of modern warfare.³⁷

Formation of Armored and Aviation Units

Important as it was, the reorganization of infantry units was but the first step in the tactical reorganization of the Army. In 1939 the Engineers began to find their place in the units that were being evolved to exploit the power of the tank and the bomber. In general, armored units were to embody the

³⁶ Memo, CofEngrs for ACofS G-3, 3 Oct 39, sub: Orgn of Div and Corps Engr Units. 320.2, Pt. 22.

³⁷ (1) Ltr, AGO to CofEngrs, 11 Dec 39, sub: Div and Corps Engrs. 320.2, Pt. 23. (2) T/O 5-187, 1 Nov 40.

classic cavalry doctrine of mobility, fire power, and shock action.

During the thirties the Army had organized the 7th Cavalry Brigade (Mechanized) to develop the special techniques of tank warfare. Repeatedly, the Chief of Cavalry and the Chief of Engineers had recommended the attachment of an engineer unit to the mechanized brigade. This was the only way, the Chief of Cavalry pointed out in April 1937, to gain practical experience in how to increase the mobility of mechanized cavalry. Lack of funds was the main reason for the War Department's disapproval of this proposal.³⁸

The most the Engineers could get at this time was the assignment of an observer to the Cavalry training center at Fort Knox. After a short time in this capacity Capt. Robert E. York came up with rather moderate proposals. While he boldly insisted that engineer troops would play an important role in support of mechanized cavalry, he was clearly under the spell of armor's potential mobility and was hard put to find specific tasks for his own service. The mechanized brigade would move so fast that only minor road repairs could be executed. Construction of shelters and other buildings would be unnecessary in a tactical movement. Mapping would probably be limited to preparing and reproducing sketches and overlays from aerial photographs. Reconnaissance would be confined to obtaining information about obstacles. The removal of roadblocks, mine fields and other deliberate obstacles, if necessary by demolitions, would constitute the main task. But he doubted there would be much, if any, need for bridging. Detours could in almost all cases be made in less time than it would take to construct a bridge. But despite the nebulous nature of these tasks the mechanized cavalry

insisted on the need for assigning engineer troops immediately. Delay in attaching an engineer unit, wrote the commanding officer of the mechanized brigade, would "retard development of the full capabilities of mechanized cavalry with respect to its chief characteristic, mobility."³⁹

At this time OCE's Military Division was recommending a squadron whose main functions would be reconnaissance, mapping, stream crossing, and the removal and construction of obstacles. The following May, Kingman also urged the organization of a squadron, though he conceded that shortages of personnel might not permit a unit this large. In January 1939 the Military Division, at the War Department's request, submitted a T/O for a troop, a unit that Kingman considered adequate for peacetime, but too small to function effectively in war. Despite all this counseling, another year slipped by before the War Department approved the activation of the 47th Engineer Mechanized Troop with a contingent of 128 men. Its functions, which Brig. Gen. Adna R. Chaffee, the new commander of the mechanized brigade, wholeheartedly endorsed, included demolitions, hasty repairs to bridges, and the provision of emergency crossings for small streams. The important fact was that the Chief of Cavalry and the Chief of Engineers now had the opportunity they had so long sought—the opportunity to arrive at conclusions from actual experience.

Whereas the Engineers had long been conscious of the need for engineer mecha-

³⁸ The discussion of the formation of engineer armored units is based upon (1) O&T Office Studies 114 and 155, in EHD files, and (2) Corresp in 320.2, Pt. 23.

³⁹ 4th Ind, ExO 7th Cav Brig to CofEngrs, 15 Oct 37, on Ltr, York to TAG, 24 Aug 37, sub: Engr Component of Cav Brig (Mecz). O&T Office Study 155, EHD files.

nized units, it was not until 1939 that they realized that similar provision would have to be made for the Air Corps. To be sure there had been some co-operation on camouflage and aerial mapping, but the construction needs of the Air Corps had scarcely been considered.⁴⁰ The initiative came from the War Department, which, in September 1939, asked the Engineers to submit T/O's for engineer units of the GHQ Air Force (the Air Corps' operating arm). In replying, Kingman made a distinction between the construction of landing fields in forward areas and the more permanent bases in the rear. For the first, he proposed the creation of an engineer aviation regiment of three battalions with a total peace strength of 43 officers and 1,050 men. It was to be trained with the GHQ Air Force and to concentrate on "hasty methods of utilizing existing facilities for landing fields, or improvising new ones." For the more extensive and deliberate construction in the rear Kingman recommended use of the general service regiment, which would be equal to the task after receiving special training and equipment. The ultimate size of the engineer component of the GHQ Air Force was left open pending experience, but Kingman recommended that one unit of each type be constituted.⁴¹ These units were needed to work out new methods of emergency runway construction, camouflage, and bomb and fuel transportation, as well as for the supply of power, water, and other utilities. "There is so much for Engineer troops to do to make the GHQ Air Force more effective on M-day," Maj. Gen. Delos C. Emmons, commander of the GHQ Air Force, wrote in February 1940, "that there can be no question as to the immediate need for the units above recommended. Much of this necessary development has been neg-

lected because of the lack heretofore of Engineer troops with the Air Corps."⁴² The Engineers decided to convert a general service regiment into an engineer aviation regiment after the April-May 1940 maneuvers.⁴³

The Impact of the German Blitzkrieg

The maneuvers of 1940 and 1941 were to form the basis for further changes in engineer organization and equipment. But in the spring of 1940 the lessons to be learned from maneuvers were overshadowed by the German blitzkrieg. The fall of France and the Low Countries and the retreat of the British to their island caused an explosive reaction in American thought. The United States was jarred into an expansion of its military forces that overwhelmed previous planning. By the end of June Congress had authorized a Regular Army of 375,000 men, and before the summer was out had provided for calling up the National Guard and for the unprecedented institution of a peacetime draft.

Whereas the Polish campaign in the fall of 1939 had reinforced the arguments of those who predicted a return to open warfare, the retirement behind fortified positions which characterized the "phony war" the following winter had caused some to pre-

⁴⁰ (1) Memo, ExO Mil Div for CofEngrs, 21 Feb 39. 475, Engr Equip, Pt. 1. (2) Ltr, Lt Col J. A. Dorst to Lt Col L. E. Atkins, 6 May 39. 210.3, Air Forces, Pt. 1. (3) Ltr, Atkins to Dorst, 17 May 39. Same file.

⁴¹ 1st Ind, 16 Oct 39, on AG Ltr 320.2 (9-19-39) P (c) to CofEngrs, 21 Sep 39, sub: T/Os. 320.2, Pt. 22.

⁴² Memo, CG GHQ Air Force for CofAC, 6 Feb 40. 320.2, Pt. 24.

⁴³ (1) 3d Ind, Actg CofEngrs (Kingman) to TAG, 21 Feb 40, on memo cited n. 41. 320.2, Pt. 24. (2) Info Bull 45, 13 May 40, Changes in Orgn of Engr Units.

dict a repetition of World War I tactics. In March 1940 Godfrey had written: "No development in recent warfare has been more striking than the renaissance of deliberate land fortifications. The Maginot Line and the West Wall have rendered quiescent the threat of an offensive on the West Front."⁴⁴ The German attack in the spring of 1940 banished this idea once and for all. But to the Engineers the blitzkrieg meant more than the triumph of mobile warfare. To them the blitzkrieg, in which German engineers took a prominent part, offered sure and final proof of their claim to an enhanced combat role.

The person who did most to publicize this conviction was Capt. Paul W. Thompson, who had been in Germany as a military observer shortly before the outbreak of the war. In May 1940, Godfrey recommended that Thompson be called to OCE to analyze reports from abroad.⁴⁵ The analysis of the blitzkrieg which Thompson made from German published sources received widespread attention throughout the Army. His first article appeared in the September–October 1940 issue of the *Infantry Journal*. By April 1941 the editor of the magazine considered Thompson "one of the wheelhorses of the corps of Journal authors," and within the next eight months published five articles under Thompson's name. At the same time Thompson was writing extensively for *The Military Engineer*, the journal of the Society of American Military Engineers. In the January–February 1941 issue he began to publish a series called "Engineers in Battle." In September, the editor of *The Military Engineer* remarked on the popularity of the articles, and upon the publication of the last one in December announced that the series would be issued in book form.

In writing for the two periodicals Thomp-

son tailored his presentation to his audience. Most of his articles in the *Infantry Journal* were general descriptions in which engineer troops were mentioned only incidentally. He did, however, call attention to matters which were the particular concern of engineers—the character of the terrain, the road net, the rivers and canals.⁴⁶ His "Engineers in Battle" series was naturally concerned almost exclusively with the role of engineers.

Typical of Thompson's descriptions of the exploits of German engineer troops was his "Engineers in the Blitzkrieg," which was published in the *Infantry Journal*. In this article Thompson stressed particularly the contribution of German engineers to the fall of Fort Eben-Emael. The capture of Eben-Emael in Belgium was a crucial point in the German plan of attack. Considered by the Allies almost impregnable, the fort had been effectively neutralized and forced to surrender in well under forty-eight hours. As Thompson described the action from the sources available to him an initial heavy bombardment had been followed by penetration by engineer parachute troops. An engineer battalion, reinforced with infantry, arrived on the outside of the fort and established contact with the parachutists within. After this, in Thompson's words:

The AA guns went into battery, firing direct at the ports of individual works. The infantry prepared to repulse any sorties or counter-attack. The engineers crawled forward, concentrating on certain individual works. They carried their explosives, grenades, smoke

⁴⁴ Memo, C of O&T Sec for CofEngrs, 7 Mar 40, sub: Land Defenses. 660, Harbor Defense (S).

⁴⁵ (1) *Infantry Journal*, XLVII (September–October 1940), 521. (2) Memo, C of O&T Sec for CofEngrs, 24 May 40, sub: Engr Intel. 091, Germany, Pt. 6.

⁴⁶ Thompson articles in the *Infantry Journal*, XLVII, XLVIII, XLVIX (September 1940–February 1941) and in *The Military Engineer*, XXXIII (1941).

candles, flame-throwers, poles, and other equipment. . . . Finally, they reached the outer walls of the works themselves.

Here the scene must have been one of terrifying action. Flame-throwers are playing against ports, grenades are bursting, projectiles from the AA guns are ricocheting, and engineer soldiers are hugging the dead spaces, throwing and placing their charges. With their explosives they are attacking the sensitive parts of the work, the ports, the turrets, the hinges.⁴⁷

In a number of respects Thompson's report on the capture of Fort Eben-Emael was in error. The parachutists arrived before the bombers; the defenders held out longer than he believed. But he did not overestimate the decisive part played by German engineers in their employment of explosives.⁴⁸

In expounding the role played by engineer troops in the capture of Fort Eben-Emael, Thompson and other Engineer commentators were aware that in the American Army assault of permanent fortifications was fundamentally an infantry mission. They were aware as well of other differences between the German engineer and his American counterpart. The German engineer was trained as an infantry soldier first and as a technician second. His main job was combat engineering. Road building and other construction (except for emergency bridging) was left to the semimilitary Arbeitsdienst (Labor Service) and the Organization Todt. Thompson warned against blindly accepting German doctrine, noting particularly that it had been developed to meet a specific enemy in a specific theater of operations:

We must ourselves keep in mind the possibility of operating under widely varying conditions—conditions where water supply might be more important than assault tactics, where labor battalions from the interior might not be available on call, or where our own air

superiority might not be such as to make of camouflage a superfluous art.

But he continued:

There is one conclusion . . . which is incontestable (and obvious). It has to do with the intimate coordination which must exist between members of the combat team. The German blitz campaigns have demonstrated this fact more forcibly, perhaps, than it ever before has been demonstrated. And as a corollary fact, the campaigns have demonstrated that the engineers are now an elite member of the team.⁴⁹

An elite member of the combat team—it was a refrain repeated over and over, and not merely by the Engineers themselves. A report of the Military Intelligence Division of the War Department General Staff had this to say:

The results of the two recent major campaigns, Poland and the West Front, are eloquent testimonials to the importance of combat engineers. Formerly it was the infantry and the artillery team that was all important, but in the light of recent operations the combat engineers take their place beside the artillery, so essential are their functions to the success of ground troops.⁵⁰

Pointing to German tactics, Schley recommended in July 1940 that the War Depart-

⁴⁷ Paul W. Thompson, "Engineers in the Blitzkrieg," *Infantry Journal*, XLVII (September–October 1940), 429. This article was distributed as Information Bulletin 63, 31 October 1940.

⁴⁸ A detailed account of the operation, translated from foreign sources, is contained in Hq EUCOM Hist Div, The 7th Infantry Division on the Albert Canal, Pt. 8, "The Battle of Fort Eben-Emael, 10 and 11 May 1940." MS, OCMH.

⁴⁹ (1) Paul W. Thompson, "Engineers in the Blitzkrieg," *Infantry Journal*, XLVII (September–October 1940), 432. (2) See also, Address, Maj. Gen. J. L. Schley, The Engineer and National Defense, 18 Sep 40, EHD files, and Rpt, Assault of Defensive Installations, 29 Nov 40, First Research Course, Vol. I, Engr. Sch. Library.

⁵⁰ MID WD, Tentative Lessons Bull 9, 5 Jul 40, sub: Preliminary Mil Attaché Rpt From Berlin on West Front Opns, May 40. 091, Germany, Pt. 6.

ment provide for joint exercises with other arms in the attack on fortified positions, but he was told that engineer techniques would have to be perfected first. Before this reply had arrived, the Engineers began to plan a research course which would examine and improve upon the tactics used in the battles of Europe. In the fall of 1940 and again in the spring of 1941 officers from nearly all engineer units and from a number of other branches of the service were brought for several weeks' stay at the Engineer School. After a period of orientation they were assigned to committees to explore designated topics.⁵¹

These topics reflected, in nearly all cases, the combat rather than the technical aspects of military engineering. Thus eight of twelve subjects studied in the first course were concerned with tactics and techniques of the assault in four different types of operations—against an organized position, against obstacles in barrier zones, against organized river lines, against enemy air bases. But some of the committees accorded more attention to the assault tactics of foreign armies and the duties of engineer troops in defense against them than to the role of engineers in overcoming the defenses of an enemy. This approach was true of the committee on barrier tactics, the committee on obstacles, the committee on deliberate field fortifications, and the committee on what began as the assault on, and became the defense of, air bases. These groups weighed the value of various obstacles in the light of their effectiveness against trucks and tanks, concluding in general that engineer troops should be particularly skilled in laying mine fields (for mines were the most effective obstacle for hasty defenses), and that the construction of large-scale fortifications was unnecessary in the continental United States and would be

impossible to execute in an overseas theater.⁵²

Several committees proposed a radical change in the doctrine on assault. Instead of being restricted to the removal of barbed wire, mines, and roadblocks, the American engineer, like the German, should also be charged with the duty of reducing concrete and steel emplacements. In a river crossing, engineer troops should be integrated into the assault team after they had delivered it to the enemy-held shore. In ship-to-shore amphibious landings, engineer soldiers would assume the lead in demolishing pill-boxes and other fortifications. A representative of the field artillery registered vigorous dissent:

Engineers have always been charged with duties involving "watermanship" and will presumably always conduct or supervise river crossings but, to imply that they should conduct assaults after a river is crossed is no more proper than it is to conclude that they are fitted to drive a tank because they have ferried it across a stream. . . . As respects the essential skills it is obvious that engineers are more competent in the employment of explosives than infantrymen and that infantrymen are normally more thoroughly trained in combat firing and scouting and patrolling. . . .

The choice, it seemed to him, was to train a very few infantrymen in the art of demoli-

⁵¹ (1) Ltr, CofEngrs to CofS, 24 Jul 40, sub: Assault Opns, with 1st Ind AG 370.2 (8-24-40) M-C to CofEngrs, 13 Sep 40. Sup Sec Rqmts Br Gen Staff (G-4). (2) 2d Wrapper Ind, Comdt Engr Sch to CofEngrs, 12 Aug 40, on AG Ltr 352.01 (7-26-40) M-C to CofEngrs, 31 Jul 40, sub: Courses at Special Sv Schs. 352.11, Engr Sch, Pt. 9.

⁵² The foregoing and following discussion of the research courses is based upon the reports in: (1) Info Bull 71, 2 Jan 41, sub: Mission, Duties, and Tng of Div Engrs; (2) First Research Course, 21 Oct-30 Nov 40, Vol. I; (3) Second Research Course, 1 Feb-1 Mar 41, Vols. I and II. The Research Courses are in the Engineer School Library.

tions or to train many engineer soldiers in the art of shooting.⁵³

The committees which defined the mission of infantry and armored divisional engineers followed much the same pattern. Although they believed the need for building permanent roads and bridges had been underestimated as a result of the blitzkrieg, they agreed that divisional engineers could not be expected to carry out this work. Divisional engineers would be much too busily occupied in emergency work on roads and bridges, removal of mines and roadblocks, reduction of organized defenses, and construction and defense of mine fields and other such hasty offensive and defensive measures.

In addition to the many pronouncements about Engineer doctrine, the committees had much to say about methods of training and about the development of new equipment—so much so that the O&T Section felt that many officers had been carried away by their enthusiasm. The demands for new equipment were “excessive.” The ideas on the training of Air Corps units were unsound as were the recommendations on the construction of deliberate fortifications and the proposals for giving radios to engineer units when wave lengths were already jammed.

But the enthusiasm created was not to be lightly dismissed. Thinking had been stimulated and confidence reasserted. Once back with their units the officers who had attended the research course shared their experiences. Moreover, many of the reports were published for circulation within the Corps, and some of the recommendations found their way into field manuals.⁵⁴ When Kingman submitted the two volumes of reports to the Chief of Staff he pointed out that they contained no radical departure

from existing doctrine—merely modifications to meet demands for speeding up operations—and concluded with the premise on which the course had been given in the first place: “A fresh emphasis was placed upon the combat function of engineers.”⁵⁵

Changes in General Units After the Blitzkrieg

Insofar as the blitzkrieg in the West had served to quicken the interest in the role of engineer troops its effect was vital but at the same time intangible. Insofar as the blitzkrieg led to a large-scale expansion of American military strength its effect was both decisive and practical.

The spring 1940 maneuvers had provided engineer troops with a better opportunity for demonstrating their usefulness than had the earlier tests of the infantry division. There were streams to bridge and there was some rain. Commanders made extensive use of simulated roadblocks. It became standard practice to attach a platoon of the engineer combat battalion to each of the division's three combat teams. Engineer officers came away from the maneuvers convinced the exercises had shown that the engineer component of the

⁵³ Minority Rpt, Assault of Defensive Installations, 29 Nov 40. First Research Course, Vol. I, p. 25.

⁵⁴ (1) Memo, ExO O&T Sec for Godfrey, 17 Jan 41, sub: Atchd Recommendations, with Incl. (2) Ltr, AC of O&T Sec to Godfrey, 25 Mar 41, sub: Info Bull based on First Research Course. (3) Memo, Engr GHQ Air Force for Maj Joseph S. Gorlinski, 26 Feb 41, sub: Rpt of Research Comm, Defense of Air Bases. All in 352.11, Engr Sch, Pt. 10.

⁵⁵ Memo, ACof Engrs for Cof S, 29 Jan 41, sub: Rpt on Special Research Course on the Technique of Assault Opns at Engr Sch. 352.11, Engr Sch, Pt. 10.

infantry division was too small and they were satisfied that this fact had been impressed upon infantry officers as well.⁵⁶

The Military Division sought immediately to capitalize upon these feelings, but was at pains to stay within the limits of what the General Staff might be willing to approve in view of the then small size of the Army. Thus Maj. Clarence L. Adcock, OCE's executive officer, suggested early in May that the Corps recommend an increase in the headquarters detachment from 30 to 60 men. By June, however, the success of the German blitzkrieg in the West was pointing to further expansion of the armed forces. Godfrey, viewing the expected increase as an opportunity to make bolder recommendations, asked the Engineer School to review the entire subject afresh. Toward the end of June, Col. Creswell Garlington, speaking for the school and the Engineer Board, recommended a minimum battalion strength of 600 to 700 men both in peace and in war. If it was felt this request would be turned down, he proposed that the increases be made under the following priorities—first, increase the headquarters and headquarters detachment to 80; second, increase the squad from 10 to 12; third, add a third platoon to each company; and fourth, add a fourth lettered company to each battalion. For the present he suggested that peace strength be at least 400 and war strength a minimum of 700.⁵⁷

In July OCE forwarded a table of organization to the General Staff calling for a peace strength of 480 and a war strength of 720. Soon thereafter the promise of men from Selective Service permitted the War Department to plan for further revisions in the triangular division and to use one strength for both peace and war. As a result, the engineer combat battalion was re-

organized in October into a headquarters company and three lettered companies of three platoons each. The total strength of the battalion was fixed at 18 officers and 616 men. The fourth company was disapproved, largely because of the opposition of Brig. Gen. Lesley J. McNair, then Chief of Staff, General Headquarters, and formerly an advocate of a single company for division engineers. The present engineer battalion, McNair argued, was already almost as large as the engineer regiment of the old square division, and unless the pressure from Engineers and other branches was resisted, the triangular division would become as unwieldy as the organization it had replaced.⁵⁸

The successes of the German panzer divisions in the spring of 1940 added spectacular support to those who were advocating a separate mechanized force within the United States Army and led to the creation of the Armored Force in July. Two armored divisions were activated with an engineer battalion in each. When advance notices indicated that the strength of the engineer

⁵⁶ Various reports of maneuvers are in 354.2 and 354.2, Bulky. See Information Bulletin 51, 26 July 1940, Third Army Maneuvers, April–May 1940, for key extracts from the reports of Engineer officers.

⁵⁷ (1) Memo (with atchd routing slip), ExO OCE for Kingman, 8 May 40, sub: Rpt on IV Corps Maneuvers at Ft. Benning. 354.2, Pt. 7A. (2) Memo, C of O&T Sec for Comdt Engr Sch [Jun 40], sub: T/O for Increased Strength for Div Engr Bn. 320.2, Pt. 24. (3) Ltr, Comdt Engr Sch to CofEngrs, 27 Jun 40, same sub. 320.2, Pt. 25.

⁵⁸ (1) Memo, C of O&T Sec for ExO OCE, 5 Jul 40, sub: Résumé of Activities O&T Sec, 28 Jun–5 Jul 40. 025, Pt. 1. (2) Memo, ACofS G–3 for CofEngrs, 10 Aug 40, sub: T/Os. 320.2, Pt. 25. (3) AG Ltr 320.2 (8–31–40) M (Ret) M–C to COs All Corps Areas, 10 Sep 40, sub: Reorgn of Triangular Div. 320.2, Pt. 25. (4) Memo, Col J. C. Mehaffey, I Corps Engr, for Adcock, 24 Mar 41, sub: Orgn of Engr Bn (Combat) Triangular Div. 320.2, Engrs Corps of, Pt. 14. (5) T/O 5–75, 1 Oct 40. AG 320.2 (7–19–40) (2).

armored battalion would be only 281, General Schley protested that German breakthrough tactics involved the extensive use of engineers. The panzer division had an engineer battalion consisting of three large companies plus a bridge train. For the engineer element in the American armored division OCE suggested a peace strength of 473 and a war strength of 620. Although the War Department explained that the battalion's initial strength would be limited by the availability of personnel in a 375,000-man army, the first battalions were activated under tables of organization calling for 466 men in a battalion made up of three lettered companies and a headquarters company.⁵⁹

Shortly thereafter men became available through the draft. The Armored Force then proposed a revision that not only increased the battalion to 712 men but, like the German panzer division, included a bridge company as well as three lettered companies. Although the inclusion of the bridge company was criticized later, its presence in the engineer armored battalion was logical in view of the expectation that armored divisions, unlike infantry, would usually operate at some distance from corps troops.⁶⁰

During the summer of 1940 the composition of corps engineers changed too. Under the T/O's for combat and general service regiments there had been little difference between the two units in peacetime strength and equipment. The general service regiment had been made similar to the combat regiment by eliminating skilled men for heavier types of work in concrete, railroad, and road construction and by adding assault boats and mines. The major differences between the two units were the greater capacity and weight of the power shovel in the general service regiment and its larger number of skilled men. The Engineer School

had argued that it would be preferable to have two combat regiments in a corps and keep the old general service regiment for heavier work in rear areas. In reviewing these tables, the War Department also noted their similarity and suggested one table for both. While OCE recognized this fact, it had wished to postpone a change until both organizations had been tested. After the April–May 1940 maneuvers, in which the units were used indiscriminately, Kingman agreed that the two engineer regiments in the army corps should be combat regiments, the general service regiment to be relegated to rear areas for heavy work. As the Army obtained more men, both the combat regiment and the general service regiment followed the combat battalion in converting to single strength tables and in securing increases in the number of enlisted men. By the end of the year both regiments had T/O's calling for over 1,220 men each—about 100 more than Schley had called for in September 1939.⁶¹

Like the combat battalion, the armored battalion, and the combat regiment, the engineer aviation regiment was classified as a

⁵⁹ (1) History of the Armored Force, Command and Center (AGF Hist Sec Study 27, 1946), pp. 7–8. (2) Memo, CofEngrs for ACofS G–3, 22 Jun 40, sub: Engr Component for Armd Div. 320.2, Pt. 24. (3) 1st Ind, AG 320.2 (6–22–40) M (Ret) TAG to CofEngrs on same memo, 16 Jul 40. 320.2, Pt. 25. (4) Memo, C of O&T Sec for ExO OCE, 5 Jul 40, sub: Résumé of Activities O&T Sec, 28 Jun–5 Jul 40. 025, Pt. 1. (5) 10th Ind (basic missing), CG Armd Force to TAG, 22 Oct 40, Incl, with Ltr, Capt Bruce C. Clarke to Godfrey, 22 Oct 40. 400.34, Armd Comd.

⁶⁰ (1) Ind and ltr cited n. 59 (5). (2) Greenfield, Palmer, and Wiley, *op. cit.*, p. 278. (3) Col. Lunsford E. Oliver, "Engineers With the Armored Force," *The Military Engineer*, XXXIII (September, 1941), 397.

⁶¹ (1) 320.2, Pts. 23, 24. (2) Info Bull 85, 18 Apr 41, sub: Road Work in Theaters of Mil Opn. (3) T/O 5–21 and T/O 5–171, 1 Nov 40.

general unit, designed for general engineer work. The Engineers considered it a combat unit, not a service unit. Although its primary mission was to build airfields, the Engineers anticipated that the unit would generally operate without support from other ground troops. Aviation engineers would be called upon to defend airfields from enemy attack and to clear surrounding areas of enemy resistance.⁶²

During the months following activation of the first engineer aviation regiment, Lt. Col. Donald A. Davison served as Engineer, GHQ Air Force. He and his executive, Capt. Rudolph E. Smyser, Jr., pioneered in studying the organization and equipment of aviation engineers. As in the case of other general engineer units, the aviation regiment's authorized strength was revised upward as its officers gained experience and the Army increased in size. In March 1941 its T/O called for 2,153 enlisted men. Even in an expanding Army it was difficult to allot men in such numbers. In October 1940 the GHQ Air Force recommended one engineer aviation regiment for each of four air districts and one for GHQ reserve but limitations on personnel allowed for an allotment of only 2,898 aviation engineers in all. Consequently, requirements for aviation engineers at overseas bases and in the various air districts had to be met by the assignment of separate companies. Nevertheless, both the GHQ Air Force and the Corps of Engineers continued to think in terms of regiments in their plans for expansion.⁶³

Finally, in March 1941, the General Staff saw its way clear to authorize an expansion of aviation engineers to 6,300. About this time Smyser, just returned from a tour of observation in the British Isles, recommended the organization of separate engineer aviation battalions instead of regi-

ments, pointing out that the battalion was sufficiently large to build one airfield in a reasonable time. Accordingly, the plan submitted by Kingman for the projected expansion provided for a regiment in GHQ reserve, a battalion for each of four air forces (formerly air districts), and battalions, where possible, for overseas bases. Since the battalion was not equipped to perform the topographic, camouflage, and supply functions handled by regimental headquarters, a headquarters company for each air force was to be organized.⁶⁴

Just as construction requirements determined that the aviation battalion would be the basic engineer aviation unit, they also fixed the place of engineers in the Army Air Forces. In the fall of 1941 each air force was organized so that all activities dealing with air bases and services, including the engineers, were placed under a service command, a step which caused Godfrey to comment:

⁶² (1) Ltr, ACofEngrs to TAG, 21 Jun 40, sub: Issue of U. S. Rifle Cal .30 M1 for Engr Regt, Avn. 400.34, Pt. 36. (2) Info Bull 74, 13 Jan 41, sub: Defense of Air Bases.

⁶³ (1) Ltr, CofS GHQ Air Force to TAG, 24 Oct 40, sub: CofEngr Sv with GHQ Air Force. 320.2, GHQ Air Force. (2) Memo, O&T Sec for Kingman, 21 Dec 40, sub: Equip and Orgn of Avn Cos. 320.2, Pt. 26. (3) 1st Ind, 4 Mar 41, on Ltr, ExO Plans Div Office of CofAC to CofEngrs, 15 Feb 41, sub: Rev Basis of Allot, Engr Trps With Air Corps. 320.2, Pt. 27. (4) T/O 5-411, 20 Mar 41. (5) Conf, 22 Nov 40, sub: Increases in Avn Engrs. OCoS, Notes on Confs (S).

⁶⁴ (1) Memo, ACofEngrs for ACofS G-3, 27 Mar 41, sub: Increase in Avn Engr Strength. 320.2, Engrs Corps of, Pt. 14. (2) Memo, Actg ACofS G-3 for CofEngrs, 17 Feb 41, sub: T/Os Avn Engr Units. 320.2, Air Corps, Pt. 2. (3) Info Bull 74, 13 Jan 41, sub: Defense of Air Bases. (4) Ltr, Col Rudolph E. Smyser, Jr., to OCMH, 24 Dec 53. (5) Wkly Rpts O&T Sec, Feb-Apr 41. EHD files. (6) Col. Stuart C. Godfrey, "Engineers With the Army Air Forces," *The Military Engineer*, XXXIII (November, 1941), 487-91.

At first thought, it is somewhat unpalatable for us to think of aviation engineer troops as part of a service command. The Corps of Engineers is an arm, not a service. However, I think we cannot quarrel with the logic of this set-up as far as an Air Force is concerned. In case of a large program of new construction, a separate construction organization seems to be indicated.⁶⁵

Godfrey's distaste for the service classification of engineer troops is understandable in view of the emphasis on combat units in the pre-Pearl Harbor years. Yet on the whole the Engineers could look back with some satisfaction to their success in adapting their organization to new demands from the Air Forces, the Armored Force, and the Infantry. Though they had to fight to maintain their position the Engineers were able to convince the Army that mobile warfare did not decrease the necessity for engineers, but rather emphasized their importance. Not all engineer units had achieved a desired

reorganization and there was a lack of harmony between theory and practice, but by Pearl Harbor the basic adjustment to a war of movement had been made.

The emphasis on combat organizations which dominated Engineer thought in the prewar years delayed consideration of special units. During the first nine months after the outbreak of war in Europe only a few of these had any real existence, but as the Army expanded in 1941 the Engineers were able to activate camouflage, ponton, water supply, dump truck, depot, shop, and additional topographic units. Changes in doctrine and organization then became subject to practical test and will be discussed in connection with the development of equipment with which the special as well as general units were so intimately connected.

⁶⁵ Ltr, Godfrey to Maj Lee B. Washbourne, 805th Engr Bn (Avn) (Sep), 26 Sep 41. 320.2, 805th Engrs.